THE ZOOLOGIST

No. 671.—May, 1897.

BIOLOGICAL NOTES ON NORTH-AUSTRALIAN MAMMALIA.

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ENGAGED on a collecting expedition, on behalf of the University Museum of Christiania, to Africa and Australia (from 1893–96), I spent nearly two years travelling in the northern and north-western portions of the latter continent, investigating the little-known fauna of this region. Special interest was devoted to the mammals, and, besides amassing a good collection, my work in this branch was rewarded by the discovery of several species of interest, some of which are new to science. A descriptive list of the mammals, by Professor R. Collett, will shortly be published in the 'Proceedings of the Zoological Society of London.'

The following short notes descriptive of the life and habits of these little-known animals may, I venture to hope, prove of some value to readers who take an interest in the zoology of tropical Australia.

The hardships of travel have undoubtedly put their limitation on my investigations, and no one is more aware than myself how superficial they are, or how little insight they give the reader to the real animal life in the virgin forests of the north. Nevertheless I feel it my duty to commit them to paper, hoping that in course of time I may be able to place a further and more detailed account of my travels before the public.

Pteropus gouldii.

This large "Flying Fox" is very plentiful throughout the north, and especially in the neighbourhood of great rivers, where it literally swarms.

It is in the mangroves on the long tidal creeks—so numerous in Northern Australia—or in the bamboo jungles along the great water-courses that the animals spend the day, assembled in flocks numbering several thousands. Hanging on the branches of the trees by their hind legs, and also clinging to each other in the same way, they almost entirely cover the trees in their camping grounds.

Such a "Flying Fox camp" is never perfectly quiet, and even in the middle of the day numbers are flitting about in and around the trees uttering their hoarse shrieks, and the cause of this restlessness may be found in the fact that one individual is not able to settle down in this enormous mass of animals without disturbing others. The buzzing noise issuing from one of these camps when heard at a distance might be compared to that of a gigantic beehive, and the clamour of the colony when disturbed is deafening. Thousands of these animals stack themselves one on top of the other in such masses that the thick limbs of large trees are split and broken by their weight, and when approached by man or any other enemy the individuals in the centre of these hordes of living creatures are prevented from quickly getting away by those hanging outside.

The native hunter of the woods takes advantage of this latter fact, and, on discovering a "Flying Fox camp," runs quickly up, and, bashing away at the struggling bats with a stick or bamboo-rod, easily secures large quantities of this highly esteemed game amongst the aborigines.

Although by no means numerous, at least one of these camps may be found on any large river, and its numbers comprise nearly all the individuals of a considerable district. At sundown the bats commence travelling, sometimes great distances, to reach a patch of the forest where the Eucalypti are in blossom, the flowers of these trees forming their principal food. A constant string of animals is then for hours issuing from the camp, and the observer who posts himself on their roving route may to a certain extent form an idea of their numbers.

BRITISH MUSEUM

I was once sitting on the bank of the Victoria river at sundown not far from a large camping ground. The bats came flying past me along the river, and, watch in hand, I commenced counting them as well as I could. After some time I arrived at the result that, superficially speaking, more than three hundred bats were passing every minute. Faster I could not count, and for more than two hours the living current continued pouring past me. According to this the camp must have numbered at least 32,000 individuals, a figure which may by no means be considered too high.

The *P. gouldii* is not very shy, and falls an easy victim to the gun of the traveller. Its fat flesh is not bad eating, and the natives consider it a great delicacy, the strong smell of eucalyptus peculiar to these animals evidently forming one of its greatest attractions.. Having killed a bat the aborigines will with utter satisfaction smell and even bite the fur of the dead body.

On the Victoria river I observed them breeding in March and April. The two young constantly adhere to their mother's breasts, which, as in most other Chiroptera, are situate in the arm-pits, and they cling to the thick fur of the mother, both when she is on the wing and resting. In this latter position the folded wings of the animal form a secure shelter for the helpless young.

Being of a pugnacious temper and very irritable, a wounded Flying Fox will pluckily attack the legs of the hunter; and, disturbed in their feeding grounds or in the camp, the bats exude their stinking excrements on the intruder.

Pteropus scapulatus.

This by no means common species was observed on the Daly river occasionally accompanying the mobs of *P. gouldii* on their feeding grounds. As to whether the two species make use of the same camping grounds, I cannot express a definite opinion. I can only state that on examining a number of Flying Foxes shot at night when feeding a few *P. scapulatus* would generally be found. The rest were *P. gouldii.*

Hipposiderus muscinus.

This rare little species is new to the fauna of the Australian continent, and has hitherto been recorded only from New Guinea.

In Arnhem Land I found it frequenting the locality where the "Wogoit" was first discovered, in the peculiar granitic formation on the western heads of the Mary river.

Crawling through the immense stone heaps characteristic of the region, one could observe these little bats suspended by the hind legs from the rocky roofs of the different chambers. Hanging in this position, their delicate bodies were constantly shaking with a light quivering motion. At a short distance from the observer they would hang perfectly quiet, but the moment I approached them with my hand they would utter a squeak like that of a mouse and flutter away to the next chamber. They seemed to feel the least disturbance of the air surrounding them. None of the specimens killed in the month of May had any young ones attached to the breasts.

At sunset they will commence hunting for insects in the forest around the hills, and are then, as a rule, seen nearly level with the tree-tops. They were numerous, and although the above-mentioned granitic formation was the only locality where I secured specimens, I feel confident of their occurrence in the caves of the central table-land.

Taphozous australis.

This insectivorous bat, with its great clumsy head, is considerably larger than the *H. muscinus*, and, contrary to the custom of the latter, it is always hanging by the fore-limbs when at rest. The granitic formation on the western heads of the river Mary was the only place where it was observed during my travels in Arnhem Land, and here it inhabited the same rocky crevices and caves as *H. muscinus.*

As a rule, it chooses slanting rocks for resting, and besides clinging to the rock by the fore limbs, as above mentioned, it also supports the body by the posterior extremities. Upon the sight of man these bats rock forward and backward with an utterly comical motion, then for a moment they sit perfectly quiet, with glistening teeth, and finally with a squeak dart at the intruder. They are only moderately nocturnal in habit. When disturbed they will very often leave the caves, and even in the middle of the day flutter about high in the air, perch in the tall trees, and after some time return to shelter amongst the rocks.

Nyctophilus timoriensis.

Of all insectivorous bats this species appeared to be the one most common in Arnhem Land. On Daly river the greatest numbers were observed, especially round the houses of the lonely Jesuits' mission station "Uniya," where they literally swarmed. Just at sunset they commenced flying, and during their flight they never arose to any considerable height, mostly keeping so close to the ground that a short stick would serve as a means for knocking them down. Their flight is feeble and fluttering, with sudden darts upward when catching an insect. Now and then a little squeak is uttered very similar to that of a mouse.

A few specimens occurred around Roebuck Bay. Although the coast of Dampier Land, especially in the rainy season, seemed exceedingly rich in insects, the insectivorous bats, on the whole, were remarkably few in number.

Scotophilus greyii, Chalinolobus nigrogriseus, Vesperugo tenuis.

All these little bats were procured in the immediate neighbourhood of Roebuck Bay, and none of the species were numerous. As I have mentioned before, the insectivorous bats were here remarkably few in number. Only now and then a bat would be seen against the golden evening sky, never arising to any considerable height, and during my stay only one or two specimens of each species were obtained. Only once in Arnhem Land did I see a bat which I believe was the *Chalinolobus*, but I failed in securing it.

Canis dingo. "Mujinn"; "Damarr."

The dismal howl of the Dingo is one of the characteristic features of a night in tropical Australia. In Arnhem Land, on Victoria River, and around Roebuck Bay, the Wild Dog was common, but mostly occurred singly or in pairs, the large packs described in the tales of bushmen as haunting Central Australia having never been observed by the author.

The hot day is usually spent sleeping in the shade of an ant-hill or in a patch of long grass, and sundown is the signal for the dogs to commence hunting. It is a common belief that the Dingoes literally hunt their prey down in packs, but no such proceeding ever came to my notice. The food of the Dingo in the vast forests and deserts of the north consists, as a rule, of smaller vertebrates, chiefly various species of lizards, *Conilurid*æ and *Muridæ*, a fact which is strongly indicated by the almost constant presence of their bones in the excrements of the animal. I do not deny that a young Macropod or Emu occasionally forms its diet, perhaps with an additional egg or young bird; but the Dingo chiefly depends on smaller animals for its existence. Its habits are sneaking and cowardly, and I hardly consider it capable of attacking a kangaroo its own size. It will kill goats or sheep, but I am inclined to believe that its tactics are more like the cunning stealthiness of the fox than the ferocious dash of the wolf.

The colonists of the southern parts of the continent are seriously troubled by the depredations of the Dingo on their sheep-farms, and the question has been very much disputed whether these Dingoes belong to the aboriginal species of the continent, or, as commonly believed, are the offspring of various crossings between Dingoes and European dogs. The latter supposition is rendered probable by the fact that Dingoes propagate with European dogs of different breeds, that is, the half-bred Dingoes of the aborigines will breed with the mongrel European dogs also kept by their masters. The question is, will these bastards on their occasional visits in the bush breed with the *wild* Dingoes? It is possible; but even supposing it to be so, I feel inclined to consider it to be the only way in which this interbreeding takes place, and consequently that its effects are very small, far smaller than generally supposed, and so small as in course of time to be almost obliterated. I am led to believe this because the Dingo type is always dominant, and because European dogs never would breed with wild Dingoes. They heartily detest them, may with advantage be employed in their chase, and only by force of circumstances breed with the half-tame individuals in the camps of the aborigines. In the north and north-west, European dogs had been in the country ten and thirty years respectively, and yet in the bush not a single specimen of Dingo was observed or shot which did not have all the specific characters of the species. These characters are very constant, and I have never seen two Dingoes differing more in form and colour than perhaps two foxes, a circumstance which to my mind indicates that the Dingo is not a breed of domestic dog gone wild—a very common belief—but undoubtedly a distinct canine species peculiar to Australia, a fact which is moreover amply proved by the occurrence of fossil Dingoes in the pleistocene formations of Australia.

The Dingo, as a rule, is shy and very cunning, and a European is seldom able to kill the animal in its lair. The stealthy aborigine, on the contrary, very often succeeds in killing it with a spear when asleep. The flesh is not much esteemed, though some old men eat it.

The traveller will, as a rule, only be able to shoot the dog with a rifle. Occasionally it will, at a respectful distance, follow a man on horseback, apparently from curiosity.

In the month of August some recently-caught pups, hardly a month old, were brought to me by the natives. They were very playful, and soon got used to my company, but were great thieves, and would on the least opportunity break their confinement, and escape to the aborigines or to the bush.

Conilurus hirsutus. "Nunjala"; "Dombot"; "Kalambo."

During my sojourn in Arnhem Land I first met with this species on an expedition to "Hermit Hill," south of the Daly river. The hollow trunks of the dwarf Eucalypti, which chiefly form the open scrubs of these desert-like sandy plains, were the chief resorts of this animal, whose habits are strictly nocturnal.

Judging from my list of specimens from this locality, the females outnumber the males by far, amongst eleven specimens only two being males. On several other localities the species was met with—in fact it is common nearly everywhere in Arnhem Land; but my series of specimens from these places are too small to admit of any conclusive comparison as to the proportionate numbers of the sexes. Nowhere, at all events, the number of males exceeded that of females, and in the total comparison the scale turns strongly to the female side. From this it may be inferred that the species is polygamous, a theory which I consider strengthened by the fact that the males were always found separately.

The number of young was invariably found to be two. They are suckled by the mother until they reach a considerable size, and will with great tenacity adhere to her teats when pulled out of the hollow trunk where she is hiding.

At night the animal roams about searching for food, which chiefly consists of the fruits of the Corkscrew Palm, *Pandanus odoratissimus*. Its movements are sudden and jerky, and the animal is a fast and clever runner, as well as a splendid climber. Being smart and well built, and in possession of a very irritable and savage temper, the bite from its strong jaws is by no means insignificant, and a nasty gash in the hand may easily be the result of a clumsy attack on the Nunjala.

Owing to its size and savoury flesh the natives pursue it, and the animal is caught by simply chopping a hole in the hollow tree where it sleeps, and pulling it out by the tail. When colonisation reaches the forest, the Nunjala, like other species of the genus, becomes a domestic parasite, and also a very noxious one.

It is said that the European *Muridæ* in the southern parts of the continent are gradually extirpating and replacing the aboriginal representatives of the *Coniluridæ*, and I shall not contradict the statement. I only feel confident that even *Mus decumanus* would find the "Nunjala" a worthy antagonist.

Conilurus penicillatus. "Pelke."

This little species occurred most plentifully in the neighbourhood of "Hermit Hill," and the natives brought me great numbers of it. According to them the animal invariably sleeps in the corners of the stiff leaves of the common Corkscrew Palm, *Pandanus odoratissimus*.

The animal may be seen at night flitting about in the trees, and in Arnhem Land is everywhere common in the vicinity of water. It is extremely savage, and bites viciously. Whenever I kept a number of them together in captivity they would always fight, and very often kill each other. Their gnawing power is very great, and they would in very short time bite their way out of any basket or cage I might put them in.

Wherever a house is built in the forest and people settle, this species, like most other *Coniluridæ*, abandons its original habits, settles in and around the house, and becomes a domestic parasite.

Conilurus boweri. "Katkomba."

This beautiful species I only had the opportunity of observing in the vicinity of Roebuck Bay, Western Australia. It does not occur in Arnhem Land. According to the evidence of the natives, like the *C. hirsutus*, it frequents the hollow trees of the Eucalyptus scrubs. I have never seen it myself, except in the houses of settlers. These corrugated iron buildings, with their rafters and framework of Eucalyptus wood, are always tenanted by the "Katkomba," the flour- and rice-bags of the store-rooms being the object of their visit.

On the Hill-station, quite close to Roebuck Bay, a couple of these parasites had their stronghold under the roof of the dilapidated house. Every evening after dark they would commence moving about, and by the flickering light of our lamps I could see the beautiful white-tailed animals rapidly crawl along the rafters overhead, and vanish into the store-room. My attempts to induce them to enter a trap invariably failed. Only by the aid of the natives was I able to secure one nearly adult specimen and two young ones. These latter were brought to me in the month of December, but probably the breeding takes place during the whole year. The number of young ones being two, I venture to propose that this may be regarded as the constant birth-rate of the genus. It will be remembered that the same number is always found with *C. hirsutus*.

Hydromys chrysogaster fulvolavatus. "Djinnjokma."

Although this species abounds in nearly all the northern lagoons, rivers, and creeks, the traveller will hardly ever see it, and even the aborigine can only with difficulty procure it.

Everywhere along the water's edge these animals dig numerous channels into the bank, like the European Water-vole, and in the water they seek their food, which chiefly consists of fish and crustaceans. The bleached shells of the latter are generally to be seen along the shore where the animal has devoured its prey.

The mode of life of this animal I had very little opportunity of observing, but I think it may be considered as chiefly nocturnal in its habits. Sometimes it will, according to the natives, come out in the daytime, but hardly without being noticed. The aboriginal hunter puts a dead fish in the water outside the hole of the "Djinnjokma," and waits with a light spear all day for the animal to come out and feed; but very often he waits in vain, at least, that is my experience.

Only once on the Daly, in the month of August, an aborigine brought me a living adult female specimen with three young ones, and a few juvenile specimens were received later. The *Hydromys* is strong, of a very savage temper, bites hard, and when irritated gives vent to a grunting squeak.

Muridæ.

The common Black Rat, *Mus rattus*, was observed in Arnhem Land, and frequently found in the dwellings of colonists. Except in these houses and their immediate surroundings, I did not observe it; but I am unwilling to lay any stress on the circumstance that no specimens of this species came to my notice during my travels in the forests. It may easily have escaped my attention, and the animal may, but certainly not to any great extent, inhabit the woods of the north. The species is undoubtedly introduced either by European ships or Malay trepang-fishers, the latter for centuries having every year visited the northern coasts of Australia.

Arnhem Land was inhabited not only by *Mus rattus*, but by a number of small species of the genus *Mus*, the specific determination of which has proved impossible, chiefly owing to the small series of specimens collected. These forms are undoubtedly indigenous to the country, and belong to the original fauna of Australia. They are so numerous and so widely distributed, even to the remotest parts of Arnhem Land, that they can scarcely be considered as introduced. In places where the white man had seldom, if ever before, trod, they seemed to occur in the greatest numbers.

These mice and rats, the size of which generally averages about that of the common *Cricetus frumentarius* of Europe, play a quite important part in the economy of nature. In order that the soil, even in its pristine condition, shall retain its power of nourishing vegetable life, a constant turning and renewal is necessary. Subsoil must in one way or another be conveyed to the surface, and replace that which has become deficient in nourishing qualities. It is a well-known fact that the termites to a great extent accomplish this work in tropical regions, and in Arnhem Land numerous ant-hills, sometimes of an enormous size, may be everywhere observed; but at the same time I cannot doubt that these small rodents perform a not unimportant part in this task of renewing the soil. The fact is that these rats are living in burrows deeply dug in the sandy ground, the earth being thrown out of the mouth of such retreats and spread outside in great heaps. However, they do not content themselves with this. Every night they continue burrowing, and the ground is perforated in all directions. In Arnhem Land I have travelled through square miles of country where the ground was literally undermined by these rodents to such an extent that the hoofs of my horses at nearly every step would break through and sink deep down in the burrows. The importance of this fact in the economy of nature can easily be understood. Every square mile of land in these localities is covered with heaps of sandy earth, sometimes dug out from a very considerable depth, and when the rainy season sets in and the ground is soaked the burrows collapse, the heaps are levelled, washed out over their surroundings, and the natural ploughing of the year is completed, while the little animals are compelled to recommence their task, and pay their house-rent by throwing earth up to the surface. Not only these *Muridæ*, but nearly every burrowing animal or reptile of this region decidedly perform a certain part—a small share—in the agricultural process of nature.

Echidna aculeata. "Melk"; "Guarang."

The Monotremes are in the north represented by a single form, the *Echidna* or "Porcupine" of the colonist. This species is found nearly all over the continent, and in Arnhem Land seemed to prefer the mountainous regions, especially the wildly broken granite and sandstone formations. In these localities it does not, as a rule, make use of its burrowing properties, but simply rests in some crevice or under the immense boulders, the setting and rising sun respectively being the signal for commencing to feed or retiring to rest.

When thought to be unobserved this clumsy-looking animal will exhibit surprising agility, and sometimes run with considerable swiftness. At the least danger it will immediately roll itself up in a protective spiky ball. Its usual food consists of termites, but the *Echidna* can for a considerable space of time endure hunger without succumbing. Once I kept a specimen tied up in a bag for more than a fortnight, lacking time to skin it, and during that period it did not obtain the least nutriment; but at the end of the confinement it seemed to be perfectly well, and dissection proved it to be in a fat condition.

The breeding was said by the natives to take place at the commencement of the rainy season, and in a female specimen examined in the drought of the year (May, 1895) there was no sign of the abdominal milk-glands commencing to swell. The ovaries contained eggs, some of which were developed to almost the size of a pea. The natives strongly denied and even ridiculed the idea of an *Echidna* laying an egg and transferring it to the temporary pouch for hatching.

The *Echidna* being dependent on termites for food, and especially well adapted for burrowing, I was surprised at not finding the animal in the low plains, where the termites were very abundant and the soil by no means harder than in the mountainous regions. But it strikes me that there is a circumstance which may have forced the *Echidna* from the plains and restricted it to the broken regions. There is no doubt that an animal burrowing in the soil is more exposed to persecution by the aborigines—the only enemy of the *Echidna*—than one hiding beneath the colossal boulders in the granite and sandstone formations; and I have no hesitation in expressing my opinion that the occurrence of the *Echidna* only in the rocky regions of Arnhem Land is in all probability due to the steady persecution of the natives.

In other portions of Australia, where the natives are less numerous, the *Echidna*, I am informed, may be found not only in the smooth undulating hills, but also in sandy plains. In the north it was, as far as my experience goes, exclusively confined to the broken ranges, large numbers being only found in the most wild and broken formations; and this circumstance, I consider, must be regarded as a very striking example of how the natural dispositions of an animal may be influenced and even altered or modified by human interference.

Perameles obesula.

This little bandicoot was very numerous in the coast country around Roebuck Bay, Western Australia. A small grass nest, quite simply built on the ground or in a hollow, forms their place of resort, which, when in danger, they readily quit to hide under another similar cover in the neighbourhood.

Great numbers being brought to me by the natives, I used to keep them in captivity, in order to investigate some of their habits. The adults did not, as a rule, seem to thrive in captivity, nor to attain confidence in the handling of man. The young ones, on the contrary, became perfect pets, and seemed to delight in crawling up one's hand and arm, or to sleep in one's pockets.

Besides being little shy of man, they exhibited great playfulness, and I well remember the amusing ways of a young animal which I placed in the cage with some adults. The moment it was liberated it ran over to one of the others, and, like a kitten, commenced to pat with its fore paws the snout of the old one, licked it, pushed it, and threw itself down on its back. In this position it lay twisting itself and kicking the snout of the old animal in mere playfulness, like a kitten playing with its mother. They lick their fur in the same way as a cat. They walk on the same principle as the *Macropodidæ*, separately moving the fore and hind feet, but their short feeble tail does not, of course, afford them any support.

Sleeping throughout the day, they lie on the side rolled up like a cat, but towards sundown commence moving. Sometimes drowsiness seems to overpower them again, and then they sit with the hind part of the body shut up, the hind legs well tucked in under the body, the chest touching the ground, and the head resting on the fore legs, which are stretched straight forward. The animals in the evening would greedily drink water, which they daintily licked, and rice or crumbs of wheat-bread seemed to give them sufficient nutriment. The species appears to require a great deal of water, and their tracks are always seen by the cattle-wells near Roebuck Bay, the only places where water may be obtained in these deserts. In places where water is absolutely absent, the dew seems sufficient for their wants. A few drops of dew gathered on the leaves of various plants would quench their thirst, and some of their food undoubtedly contains a certain quantity of moisture.

As regards the breeding of this species, a fact of considerable interest was noticed. In the pouch of the female (which, by the way, has the opening turned towards the anus) as a rule three young are found in the earliest stage of development after birth. When the half-grown post-fœtal stage is reached only two remain; and when development is nearly completed, and the young animal almost fit to leave the pouch, only one is left. This most uncommon phenomenon amongst mammals is very constant in this species, and may admit of the conclusion that the young of *Perameles obesula*, during their post-fœtal stages in the pouch, have greater difficulties to contend with, and are subject to more dangers, than those of most other marsupials.

Perameles macrura. "Koppol."

In Arnhem Land this Bandicoot abounded, especially in the neighbourhood of large rivers and creeks. A burrow in the soil lined with soft grass, a little grass nest on the ground or in a hollow log, usually constituted the dwelling of this large *Perameles*, whose savoury flesh forms a considerable part of the animal food so relished by the aborigines; indeed, the "Koppol" is nearly the best game of Australia, and well roasted it does not much differ from a small sucking-pig. The only circumstance which may restrain the hungry traveller from enjoying a "Bandicoot" steak, is, that the animal very often is infested with a large tapeworm. Whether this tapeworm, which reaches an enormous length and very likely at full development causes the death of the animal, is transmissible to man or not, I am unable to express any opinion. The natives never seemed to suffer from a similar complaint.

At sundown the animal will come out, feeding all the night on seeds, herbs, and insects. With rice as a bait it is easily trapped, and occasionally it will visit the pack-bags of the traveller when encamped for the night. It drinks frequently.

More than one young was never found in the pouch of the female.

The animals are very agile, run fast, and when pursued quickly turn with great dexterity and presence of mind.

Pseudochirus dahlii. "Wogoit."

Before entering the big central tableland of Arnhem Land, the traveller will in the neighbourhood of the western sources of the river Mary find a very peculiar granitic formation.

From the plain country, the soil of which chiefly consists of a coarse granitic sand, there inwardly rises the huge Eucalyptus forest, hill by hill, with wild torn forms, and on the very hills grows plentifully the cypress of North Australia, *Callitris robusta* (*vulg.* cypress-pine).

These hills, which are only parted by small valleys, never show any primitive rock, but rise from the granite like colossal heaps of stones and *débris.* Granitic boulders in all sizes and forms are heaped up on each other to a height of more than a hundred feet, and through crevasses and passages one may, crawling or walking, penetrate the whole of the dark interior of the mountain. In these surroundings I found, in May, 1895, besides the usual cave-dwellers of the north, *Dasyurus halocatus*, *Petrogale brachyotis*, and the rare *P. concinna*, a *Pseudochirus* new to science.

The natives called it "Wogoit," and in the 'Zool. Anzeiger,' No. 490, 1895, and in the 'Proceedings of the Zoological Society of London,* Prof. R. Collett, of Christiania, has described it under the name of *Pseudochirus dahlii*, "the Rock Phalanger."

Subsequent expeditions showed me that the species also occurred numerously in the great central tableland; but outside these localities I never discovered the slightest trace of the animal.

The Wogoit is a strictly nocturnal animal, which spends the day sleeping in the caves and crevasses of the granitic heaps, choosing the darkest recesses as a resting-place. After sundown it crawls out from cover, seeking food in the blossoming gum trees, such as *Eucalyptus miniata* and *tetrodonta.* It also commonly frequents a species of *Terminalia*, which carries a fleshy, and even to the human palate, savoury stone-fruit. At the break of day the Wogoit again takes refuge in the dark depths of the caves.

Generally the animals are found in pairs, male and female, sometimes accompanied by a half-grown young one. When at rest the animals very often lie squeezed flat in some crevice, without regard as to its being horizontal, vertical, or slanting, or coil themselves up in some dark corner. In this latter position they sit rolled up nearly in a ball, the hind legs frequently crossed, like those of a tailor. The right hind leg is, as a rule, stretched out, the left thrown across it, which both fore paws grasp. The tail is curved forward and upward, past the left ear, and the head bends deeply over the fore paws.

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* Shortly to be published.—Ed.

Their walk, during which the tail is kept straight out, is firm and sure, and very much approaches the so-termed "amble." They are clever climbers; their run is a kind of quick trot, or perhaps, more correctly, a very fast crawling; and although in the daytime they seem sluggish animals, one is surprised at the wonderful agility which they exhibit at night, or when in danger of life.

The breeding takes place all the year round, and the young remains in the pouch of the mother until it acquires the thick fur characteristic of the adult animal. After this stage of development it follows the parents for a longer space of time, probably until its own sexual propensities are awakened.

The food is grasped first with the mouth, afterwards with the hand, the first and second fingers of which may be put in contraposition to the others. As a rule the left hand is used. They eat sitting on the hind legs, in a very prone position, the back shot up, the head and fore limbs low. Water they lick in the same way as a dog. The meal finished, the face and snout are cleaned with the fore paws, very much on the same principle as that employed by the Cat, but, contrary to the Cat, they use both fore paws at once, one on each side of the face.

Their temperament must be characterized as soft, but attacked they will defend themselves fiercely with teeth and claws. Fights between the males are scarce, or do not perhaps take place at all; but the female sometimes vigorously pulls the ears of her better half, a course of proceeding which may with impunity be adopted, as she is the bigger and stronger of the two.

The muscular power of the animal in proportion to its size must be termed colossal, and a man must strain every nerve and fibre of the hand and arm to master a living individual.

The "Wogoit" is an utterly nocturnal animal, and can only with great difficulty bear the daylight, and except compelled by the utmost necessity never leaves the stone-heap or cave where it lives.

The eye has in the darkness a strong glow like a flashing ruby, and death is accompanied by a strong dilatation of the vertical pupil.

In captivity it very soon becomes familiar with the man who feeds it, but soon dies when removed from its native land, with the loss of its usual food, and the climatic conditions of the country where it was born.

Trichosurus vulpecula. "Vie"; "Uia"; "Uidda."

Being strongly pursued by the aborigines and easily caught, this species is not numerous in any portion of Arnhem Land. It is nearly everywhere to be found, but the traveller may search the moonlit woods night after night without seeing a single animal, and in no locality do its numbers in any way approach those of the southern colonised parts of the continent. The brown variety was only found in the jungle around the river Daly, and all the specimens shot or captured in the open Eucalyptus forest were of the common bluish grey colour. In the vicinity of Roebuck Bay, Western Australia, the species was occasionally met with, and in all the specimens I examined the fur was of the latter colour.

The *Trichosurus vulpecula* breeds in the north all the year round, and only one young is found in the pouch of the female.

On leaving the pouch of the mother animal the fur of a juvenile specimen has a strong grassy green tinge, which gradually fades, and after two or three weeks gives place to the general colouring of the adult.

Captured in infancy, it is, like most marsupials, easily tamed, and after a time gets very attached to man.

They eat almost any vegetable, from a grass-root to the fruit of the tallest Eucalyptus, and seem to require a good supply of water. In captivity they will drink at least once a day, generally a little after sundown, and on lagoons and rivers their tracks are generally seen at the water's edge.

Petaurus breviceps. "Lambalk."

The Little Flying Squirrel is found all over Arnhem Land, but owing to its small size and mode of hiding in the hollow branches of large trees, I always found it difficult to obtain. It is nowhere numerous, but more common along the coast than in the interior. I only succeeded in securing specimens on a few occasions.

Like all the other *Phalangistidæ*, it is strictly nocturnal, and using its flying membrane the little animal will swiftly move from tree to tree searching for food. The "flying" only consists in sliding from a higher tree to a lower one, or to the ground, using the large expansion of the skin between the fore and hind legs as a parachute. Curiosity will sometimes induce this little Squirrel to visit one's camp, and on one of the heads of the Mary river I remember one of these little animals appearing every night towards daybreak, examining our camp, until one day we discovered its hiding place in a hollow tree and killed it.

The *Petaurus* having no pouch, the young simply adhere to the teats of the mother. During their most helpless stages I am inclined to believe they are always fixed to the mother in this way, this being also the case with other marsupials destitute of a pouch, such as the *Dasyuridæ*. Later on the young are undoubtedly left behind in the lair, as their size and number would prevent the mother from moving with sufficient ease. They are sucklings until they have reached half the size of an adult individual, and their number is three; at least, that was the number in the only case I had the opportunity of observing.

In the vicinity of Roebuck Bay this species was not uncommon.

Dasyurus hallucatus. "Jirian"; "Tjabbo."

This species occurs nearly everywhere in Arnhem Land, but according to my experience never plentifully except in the mountainous parts of the country. Although in the forest-clad plains it resorts to the hollow trees as a hiding-place, the broken rocks and boulders in the mountain ranges seem to have a greater attraction, and in their branching caves and crevasses the little "native Cat" finds a secure resting-place.

Although the habits of the animal are nocturnal, it very often commences hunting a little before sunset, and I once saw it moving about in broad daylight.

Walking or running it carries its tail erect like the *Felis* *domesticus*. It is not a very fast runner, and on horseback, in open country, is easily overtaken.

The young ones are at birth only the size of a very small pea; and their number is, compared with that of other marsupials, very great, nearly every teat of the mother carrying one.

The crippled trees of the northern forests form the nightly hunting-grounds of the species, and its food consists of insects and small vertebrates. Occasionally it goes down to water to drink. It is a nuisance in meat-stores, will greedily eat fat or tallow, and with this as a bait is easily enticed into a trap. The settlers accuse it of bloodthirstiness, and of wantonly murdering fowls or chickens like the European Weasels, qualities which in my opinion are more attributable to another representative of the *Dasyuridæ*, the *Phascologale penicillata*.

Phascologale penicillata. "Wombo."

This pretty little species, commonly termed "Brush-tailed Rat" by the colonists, is one of the most widely ranging of Australian *Dasyuridæ*. It is found nearly all over the continent. In Arnhem Land it appeared to be most common towards the central parts. In the coast country, and around the long tidal river-mouths, I only once saw it, and the "Wombo," as the natives call it, seems to be more adapted to the dry inland scrubs than to the better watered jungles and forests of the coast. In the low broken ranges between Fountain Head and Union Town, and on the railway line, it generally occurred; and also on the rivers Mary and Katherine it was frequently observed. In fact, nearly everywhere inland it was very constant, and on a moonlight walk one would generally expect to see this little marsupial nimbly climbing about amongst the twisting branches of the box tree, or the red gum, whose hollow trunks serve it as a shelter during the daytime.

In the fowl-yards of the settlers it commits serious depredations, and at the store at Fountain Head two dozen fowls were killed in three weeks by these little bloodsuckers, who seem to possess the same devilish thirst for blood as the Weasels of Europe.

The "Wombo" is a smart and clever climber, and moves with great swiftness in a sudden jerky manner, which enables the traveller easily to detect it in a moonlight night. Very often it will, either from curiosity, or in search of food, approach one's pack-bags in the camp, and most bushmen accuse it of eating the fat of their dried salt beef. Two young ones were once brought to me by the natives. Close to Roebuck Bay, Western Australia, a specimen was shot and preserved, but the species did not seem to be common, as this single specimen was the only one observed during five months' collecting in this locality.

Sminthopsis nitela.

This beautiful little species, which Prof. R. Collett, in the 'Proc. Zool. Soc. of London,'* has described as new to science, was brought to me by the natives on the Daly river, about sixty miles from the coast. According to their evidence, it was found sleeping in holes in the ground. Undoubtedly it is nocturnal in its habits, like the other *Dasyuridæ*.

Phascologale flavipes leucogaster.

This occurred in the same locality as the above-mentioned species. Only one specimen came under my notice, and my native collectors brought it to me tied with a string round the hind leg. When placed on the ground it exhibited considerable agility. Presumably its habits are nocturnal.

Petrogale concinna. "Bolwak."

This rare little "Rock Wallaby" was met with only in two places in Arnhem Land. Once on the Daly I shot a single specimen on an unknown mountain on the eastern side of the river, about one hundred miles from the river mouth. Subsequently I met the species in the broken granitic country around Mount Gardiner, to the west of the river Mary, and there it occurred in great numbers.

Deep in the caverns and crevices amongst the colossal granite boulders, where the rays of the sun never reach, the little wary "Bolwak" spends the day, sleeping lightly. It is easily disturbed, and will with astonishing agility flee from rock to rock. Their speed and dexterity is simply marvellous, and seeing one of these little wallabies running through the broken country, one might almost imagine it to be the shadow of a bird flying swiftly overhead.

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* Not yet published.—Ed.

The stone seems to afford a better hold for their rough-soled feet than the soil, and they always, when running, keep to the rock, turning and twisting themselves with cat-like cleverness, and running up or down apparently perpendicular cliffs with the same ease as on the level. They will squeeze through nearly any opening, are extremely shy, and I never in my wide wanderings met an animal that puts a man's shooting more to the test. Just at sunset they come out and, perched on the rocks a short time before commencing to feed, they seem to enjoy the cool evening air and the gorgeous tropical sunset. The least noise will then disturb them, even in places where the crack of a gun has never been heard, and, like flitting shadows, their light forms will noiselessly vanish among the broken boulders. Occasionally they will go down to water to drink, but they do not seem to require it as often as many other *Macropodidæ*. They breed all the year round. Only one young is born at a time, and the mother abandons it immediately when in danger.

Petrogale brachyotis. "Doria"; "Petpungo."

This handsome "Rock Wallaby" was met with in the same localities as the *P. concinna*, but seems to prefer country with larger features. It has a far wider range, and is found on nearly every large broken hill or mountain. In the torn and rugged sandstone ranges around the mouth of the Victoria river, and in the large central table-land in Arnhem Land, great numbers were observed.

Its mode of life and habits are very much the same as those of *P. concinna*, but, being a heavier animal, it is less graceful, and is without the marvellous agility and swiftness of that animal.

Onychogale unguifera. "Karrabbal."

This pretty Wallaby, the tail of which at its extreme point is furnished with a very peculiar horny spike or nail, was only observed in one locality in Arnhem Land.

Around Fountain Head and the Glencoe cattle depôt the country assumes a certain desert-like character; crippled scrub is scattered over vast flats, where innumerable ant-hills tower like churches with domes and minarets, brick-red and baked in the parching sun. In these barren surroundings the little Wallaby was sometimes found sleeping in a tussock of coarse spear-grass. When disturbed it would utter a quickly repeated guttural u-u-u, and flee with great swiftness. When the animal is running it carries the tail, like other *Macropodidæ*, curved down backward and upward, but in a stronger and more pronounced degree, so as to nearly form a semicircle. The head and fore part of the body is at the same time carried lower, and more stooping than customary with wallabies or kangaroos.

In the vicinity of Roebuck Bay it was frequently found on the edges of the large open coast plains, chiefly choosing the dense *Melaleuca* thickets for resting. Towards sundown the pretty animals might be observed on the open patches amongst the thickets cropping the green grass of the rainy season. In the dry time of the year *Melaleuca* leaves and grass-roots undoubtedly form a greater part of their diet.

As a rule the *Onychogale* is very shy, and in none of the above mentioned localities did it occur in great numbers, more than one or two seldom being seen in a day's march.

Bettongia lesueurii. "Jalva."

In the sandy country surrounding Roebuck Bay, Western Australia, the ground was nearly everywhere and in all directions excavated by the burrows of this little Macropod, which by the aborigines of the place is called "Jalva," and by the few Europeans generally termed "Kangaroo-rat." The animals avoid the open plains, but all the scrubs, and especially the slopes of the gently rising and falling sandhills, are inhabited by countless numbers. Several animals, in fact a whole colony, dig their burrows quite close together, and all the different channels communicate with each other, so that each animal does not have a separate dwelling. The burrows have not, like those of the fox or the badger, the opening constantly turned down the slope of the hill, but run in all directions. The animals do not seem to find it more difficult to throw the *débris* up than down the decline of the hill. Digging for their food, which chiefly consists of a small ground-nut called by the natives "nalgoa," they pursue the same course as mentioned in their burrowing, never paying any regard to whether they are digging up or down hill. Not only do the individuals in a colony inhabit the communicating burrows in common, but even between different colonies intermigration takes place—in fact, all the animals within a fairly large area seem to form one large family, the members of which are very independent of each other. The "Jalva," of course, must be termed a gregarious animal, but the gregarious disposition of each individual is not in any remarkable degree pronounced. The fact that the animals are living together in colonies may, I think, be better explained by considering that long experience in the course of time has undoubtedly taught them that it is far easier for ten or perhaps one hundred animals to dig a complicated burrow than for one to do so.

The day is spent sleeping in the channels of the burrow, and just at sunset or immediately after the "Jalvas" commence to appear outside. Nimbly skipping amongst the sand-heaps and the scanty herbage, the agile animals very soon saunter off in search of food. All night they are roaming about feeding, and, according to my experience, they never drink, at least during the dry season. Their tracks were never seen near any well nor on the shore of the ocean, and, although a watering trough for cattle was situated within two hundred yards of one of the places where I used to procure my specimens, I invariably failed in discovering tracks of the animals at the little pool of water which procured its supply from the leaking trough.

However crooked and complicated the burrows of the "Jalva" are, still some of their most dangerous enemies are not prevented from intrusion. The large pythons, for instance, *Python molurus* and *Aspidites melanocephalus*, frequently visit the colonies in search of prey. I have never caught the pythons in the act of devouring the animals, but the unmistakable large tracks of these snakes—the largest in this locality—were often seen leading in and out through the different holes of the "Jalva" colonies; and the natives unanimously affirmed that the snakes came there to eat the "Jalvas." In the north I have frequently found hair and bones of *Petrogale brachyotis* in the excrements of large snakes.

During the long dry season the aborigine is not a very dangerous enemy to the "Jalva," but when the rains set in, and, especially in a heavy wet season, perfectly soak the ground, the burrows collapse. The boggy condition of the earth does not admit of any new digging, and the unfortunate animals are compelled to seek a very unsafe shelter in the grass. Flushed from its place of hiding, and being a poor runner, the "Jalva" is easily overtaken by the native and his dogs, large numbers being often killed in a short time.

One young is born at a time, and the breeding goes on continuously all the year round.

Macropus robustus. Male, "Tjikurr"; female, "Tjugeri."

The large black "Wallaroo" of South-eastern Australia was observed only in the sandstone ranges of the central table-land in Arnhem Land. In the wild and broken cliffs or precipices surrounding the large gullies where the South Alligator river flows, and a white man has seldom before wandered, a scanty tribe of the Robust Kangaroo was struggling for life against the steady onslaught of the aboriginal hunter of these lonely mountain valleys. Not long ago, my dark companions affirmed, the "Tjikurr" abounded; but constant hunting had reduced their number to a minimum. The frequent occurrence of old excrements and well-worn paths amongst the rocks amply corroborated the statements of the natives; only now and then a specimen could be seen, and a female with a young one in its pouch was all I obtained (June, 1895).

In the shade of some overhanging rock, in cracks and crevices, and even in the deep dark caves and caverns in the precipices of the table-land, honeycombed by the work of the ocean thousands of years ago, the "Tjikurr" was sleeping during the hot tropical day. The least noise would disturb it. Even the light patter of the naked feet of the aborigine would start the wary sleepers, and cause the black animals to flee with huge bounds through the broken rocky country. Their speed and agility is all the more surprising owing to the considerable size of the animals, and can only be compared to that of the little *Petrogale concinna.* They literally seem to fly through and over the most difficult obstacles. Without hesitation they would precipitate themselves down cliffs of considerable height, and with equally astonishing energy they would rapidly ascend apparently inaccessible mountain walls and heaps of boulders.

Macropus antilopinus. Male, "Koppo"; female, "Kondaltburu."

This large species, so rare in the collections of Europe, is exceedingly numerous in Arnhem Land. Although it seems to prefer hilly country, the traveller may often meet it in the plains at a considerable distance from any mountain. There did not seem to be any distinct rule for its occurrence. One would always be sure to find it in any big range, and in the undulating ironstone; in some places it was frequently seen, but not constant, and the only localities where I certainly never observed the slightest trace of it are the large open plains on the lower tidal portion of the river Daly. The large jungles also never seem to offer any attraction. In the sandstone ranges on Victoria river the animal abounded.

The "Red Wallaroo" is nearly always met with in great mobs, consisting of females, young, and young males. "Old men" or adult males are very often found single, or sometimes accompanied by a female, and strong animals of any sex or age may sometimes be observed single; but typically *M. antilopinus* is a gregarious animal.

In some mountain valley, or in the shade of some trees, the animals form what is commonly termed a "camp"; that is, each animal scratches a slight depression in the sandy soil, and there neatly coils itself up to sleep during the hottest part of the day. In the afternoon, or towards sundown, they commence feeding on the green shoots or roots of various grasses, and sometimes at considerable intervals they will make for water. For how long a period they can dispense with water I do not know, but this species, like so many Australian mammals, seems in a considerable degree to be independent of it. In places where water is abundant they do not seem to drink every day, and sometimes one will meet the "Red Wallaroo" in places where water could only be procured by travelling long distances.

All through the night the animals are feeding; even the early morning and forenoon are very often devoted to the same occupation, and only through the hottest part of the day they rest in the camp, to which they constantly return. With such precision do the Kangaroos—and especially the solitary ones—return to their usual camps, that the aboriginal hunter by this circumstance is greatly aided in killing them. Covered with mud from head to foot, to retard perspiration, he either stands in wait at the Kangaroos' camp or sneaks upon an already resting animal, and at a short range easily transfixes it with his spear.

The "Koppo" being the largest Kangaroo in the north, and its flesh highly prized by the natives, the animal is subject to a very vigorous persecution, and in consequence thereof is exceedingly shy and wary—so shy as to be almost unapproachable in certain localities to the European hunter.

To observe this large Kangaroo at a close range is a rare occurrence, and one that very seldom befell me; but one of the lay brothers of the Uniya mission-station on the Daly gave me a few facts from his experience. For a long time the missionaries were living to a great extent on Kangaroo flesh, and, being an excellent shot, it usually fell to the lot of this brother to procure the animals. Armed with a rifle, he would quietly invade the Kangaroo camp. The mob would then flee, and my lay brother, hiding himself amongst the stones, waited in perfect quietness. After some time the animals would return, first the young ones, then the adults, and very soon the camp life would go on as usual. The young animals would, according to his statement, exhibit great agility and playfulness, fight and box each others' ears, whereas the old individuals were more lazy and slow in their movements. An old Kangaroo will, with an utterly comical expression in its stupid face, stretch its huge limbs and scratch its ears like a sleepy man. When an "old man" was wounded it would pluckily attack, and my narrator had made a kind of rough cutlass which he employed in slashing down the wounded Kangaroos to save his small store of ammunition.

At any time of the year young animals which recently have left the pouch are seen accompanying their mothers, and I think this may justify the conclusion that the *Macropus antilopinus*, like most other marsupials, breeds all the year round.

Macropus agilis. "Ma"; "Bulak."

The Jungle or River Kangaroo, the most common *Macropus* of the north, is found in countless numbers at nearly every large river in Arnhem Land. The day is spent resting in the shade of the jungle, where the animals, singly and in small droves, stretch themselves in shallow depressions scratched in the soil, sandy patches being preferred. Towards sundown, when the heat of the day is somewhat modified, they commence running about to feed. Every night the Jungle Kangaroo goes to the river to drink; but the time for its visit to water may vary, and is in a remarkable way influenced by the moon at different stages.

When the full moon rises just after sundown, and practically all night throws its bright vertical light over the landscape, the animals at any time, when thirst compels them, make for water. By crescent and decrescent moon, on the contrary, when only the first and last hours of the night are dimly illuminated, sundown is for all Kangaroos the signal to seek water. They must have light; in darkness no Kangaroo dares to approach the river, and that with good reason; because at the drinking-place the hereditary foe of the species, the great *Crocodilus porosus*, is lying in wait, and, notwithstanding all precautions, its strong jaws close on many a young and inexperienced individual. Many are the victims which during lapse of time in this way have succumbed, and the species has in consequence, in especially exposed places, learnt to take its precautions to anticipate the cunning devices of the Crocodile.

Where long flat sand-banks stretch out into the river, *Macropus agilis* chooses its drinking place. Here the animals have a free view, and, what is more important, they do not need to drink at the very shore. For a distance of several yards from the water's edge they dig a hole in the water-soaked sand, patiently wait until this is filled, and thus safely quench their thirst. In places where no Crocodiles are found this course of proceeding becomes unnecessary, and is consequently not employed. These facts may be considered as illustrating to what a considerable degree difficult and strongly exposed conditions of life are capable of improving the intelligence of a species.

All night the Kangaroos are feeding in the open forest or in the plains, and shortly after sunrise they return to the jungles. Besides the Crocodile, the Jungle Kangaroo has only one enemy of importance—the aborigine; but, thanks to its cunning and the imperfect hunting methods of the native, the species is nearly everywhere exceedingly plentiful.

Sometimes this species is also found very numerous in dry desert-like regions along the coast, and it will be here observed that its need for water is considerably modified according to its surroundings. In the desert-like sandy plains around Roebuck Bay on the coast of West Australia the species was perhaps even more numerous than along the rivers of Arnhem Land. With two exceptions, no surface-water was here to be found, and the animals quenched their thirst either by the moisture obtainable with their food, or by going to the shore of the ocean and drinking the brine.

ON THE DISTRIBUTION OF MARINE MAMMALIA.*

By P. L. Sclater, M.A., Ph.D., F.R S.

I. *Introductory Remarks.*

Most of the recent writers on Geographical Distribution have confined their attention to terrestrial mammals, or at any rate have but casually alluded to the marine groups of that Class. On the present occasion I wish to call your attention to some of the principal facts connected with the distribution over the world's surface of the marine or aquatic members of the Class of Mammals.

Aquatic mammals which pass their lives entirely, or, for the greater part, in the water are, of course, subject to very different laws of distribution from those of the terrestrial forms. As regards aquatic mammals, land is of course an impassable barrier to their extension, and, subject to restrictions in certain cases, water offers them a free passage. Just the opposite is the case with the terrestrial mammals, to which in most cases land offers a free passage, while seas and rivers restrain the extension of their ranges.

The groups of aquatic mammals that are represented on the earth's surface at the present time are three in number, *viz.*:—(1) the suborder of the Carnivora, containing the Seals and their allies, generally called the Pinnipedia, which are semi-aquatic; (2) the Sirenia, which are mainly aquatic; and (3) the Cetacea, which never leave the water, and are wholly aquatic. We will consider briefly the principal representatives of these three groups, following nearly the arrangement of them employed in Flower and Lydekker's 'Mammals Living and Extinct.'

II. *Distribution of Pinnipeds.*

The Pinnipeds, which I will take first, comprise three distinct families—the *Otariidæ*, the *Trichechidæ*, and the *Phocidæ*.

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* By the courtesy of Dr. Sclater we have received an advance proof of this important paper, read before the Zoological Society of London on March 16th.

Beginning with the *Otariidæ* or Eared Seals, commonly known as Sea-lions and Sea-bears, we find the greater number of the species confined to the South Polar Ocean, where they pass most of their time at sea, but, as is well known, resort to the land at certain seasons for breeding purposes. In the Atlantic Ocean, so far as I know, the Eared Seals have never been ascertained to occur further north than the estuary of the La Plata on the American coast, and the vicinity of the Cape on the African coast. But in the Pacific, on the contrary, three distinct species of *Otaria* are found all over the arctic portion of that ocean, and there are well-founded traditions of Eared Seals having been formerly met with in the Galapagos, while they still occur on the coasts of Peru and Chili. I think therefore we may assume that *Otaria* was originally an Antarctic form, but has travelled northwards along the West American coast and is now firmly established in the North Pacific. In a parallel way in the class of birds, the Albatrosses, *Diomedea*, which are essentially a group of the Antarctic Seas, are represented by three distinct species in the North Pacific.

The second family of the marine Carnivora, on the other hand, the Walruses, *Trichechidæ*, are entirely Arctic in their distribution; one species, *Trichechus rosmarus*, being peculiar to the North Atlantic, while a second nearly allied species, *T. obesus*, takes its place in the Northern Pacific.

The third family of Pinnipeds is more numerous and varied, both in genera and species, than the two preceding, and has a more extended range. The Seals, *Phocidæ*, embracing about nine different generic forms, are most numerous in the Arctic and Antarctic seas, but are also feebly represented in some intermediate localities. Beginning with the North Atlantic, we find several species of *Phoca* inhabiting various parts of this area, and the Grey Seal, *Halichœrus*, and the Bladder Seal, *Cystophora*, exclusively confined to it. In the North Pacific all the four true Seals belong to the genus *Phoca*, and three of them are identical with the North Atlantic species, but when we descend as far south as the Gulf of California on the American coast we meet with a species of Sea-elephant, *Macrorhinus*, which, like *Otaria*, has no doubt penetrated up here thus far from its ancestral abode in the Antarctic Ocean.

Returning to the Central Atlantic, we find two species of Seals inhabiting these waters, both belonging to the same genus *Monachus*. One of these, *M. albiventer*, inhabits the Mediterranean and the adjoining coasts of the Atlantic, while the other, *M. tropicalis*, is in these days restricted to some of the smaller and less known islands of the West Indies.

The *Phocidæ* of the Antarctic Ocean all belong to genera distinct from the Arctic forms and more nearly allied to *Monachus*, the Seal of the Mid-Atlantic. They are of four species, belonging to as many genera: *Ogmorhinus*, *Lobodon*, *Leptonychotes*, and *Ommatophoca*. Besides these the Sea-elephant of the whalers, *Macrorhinus*, is essentially an Antarctic form, though now nearly extinct there, after long persecution by man. But, as already noted, it extends, or has in former days extended, far up the West Coast of America, and is still occasionally found on Santa Barbara Island on the coast of California.

III. *Distribution of the Sirenians.*

Only two forms of Sirenians are at the present time existing on the earth's surface—the Manatee, *Manatus*, and Dugong, *Halicore*,—each representing a distinct family of the Order. The Manatee is an inhabitant of the coasts and estuaries of both sides of the middle Atlantic Ocean, one species, *Manatus senegalensis*, occurring on the African shores, and another, *M. americanus*, on the South American coast and in the Antilles. A third species, *M. inunguis*, so far as we know at present, is found only in fresh water high up the Amazons.

The Dugong, *Halicore*, is distributed from East Africa, along the shores of the Indian Ocean and its islands, to North Australia. Three species of this genus have been established: *Halicore tabernaculi*, from the Red Sea; *H. dugong*, from the Indian Ocean; and *H. australis*, from Australia; but it is doubtful how far these forms are actually distinguishable.

Besides *Manatus* and *Halicore*, a third quite distinct form of Sirenian was formerly an inhabitant of the North Pacific. This was Steller's Sea-cow, *Rhytina stelleri*, by far the largest animal of the group, which was exterminated by human agency about 1768. Fortunately, recent researches in Behring's Island have been successful in supplying specimens of its skeleton for our principal museums, and Steller, its discoverer, left to posterity a good account of its habits and anatomy.

IV. *Distribution of Cetaceans.*

Adopting the recognized division of the Cetaceans into two Suborders (Mystacoceti and Odontoceti) according as to whether their mouths are furnished with baleen ("whalebone") or teeth, we will first consider the True or Whalebone Whales, which consist of a single family *Balænidæ*, usually divided into five genera—*Balæna*, *Neobalæna*, *Rhachianectes*, *Megaptera*, and *Balænoptera*. Of these, *Balæna*, *Megaptera*, and *Balænoptera* are almost cosmopolitan—species of them, whether distinct or not is at present more or less uncertain, being met with in nearly every part of the ocean. But *Rhachianectes* has as yet been ascertained to occur only in the Northern Pacific, and *Neobalæna* in the South Polar Ocean; so that we have in these cases two well-marked local types to deal with.

The Toothed Whales (Odontoceti) are more diversified than the preceding group, and are usually held to embrace at least four existing families besides several extinct forms. The first family, containing the *Physeteridæ*, or Sperm Whales, consists of at least six genera—*Physeter*, *Cogia*, *Hyperoodon*, *Ziphius*, *Mesoplodon*, and *Berardius*. *Physeter* and *Cogia* are inhabitants of the whole oceanic area between the tropics, extending in certain localities some way beyond them. *Hyperoodon* is confined to the North Atlantic. *Ziphius* has an extensive range, and has been found in nearly every part of the ocean. *Mesoplodon* is also widely distributed, but is apparently more abundant in the Southern Hemisphere. *Berardius*, however, so far as we know at present, is restricted to the South Polar Ocean.

The third family of Toothed Whales contains only the *Platanistidæ*, or Freshwater Dolphins, which although, in some cases, at the present day entirely fluviatile, must necessarily have all descended from what were originally oceanic forms. The three known genera are *Platanista* of the Ganges and Indus, *Inia* of the river Amazons, and *Pontoporia* of the river La Plata; the last form making a connecting link between the two preceding genera and the marine Dolphins.

The fourth family of Toothed Whales, containing the Dolphins, *Delphinidæ*, is very numerous in species, and embraces at least fifteen or sixteen genera. But in spite of the efforts of Mr. True, who has recently given us an excellent summary of our present knowledge of them,* both the genera and species of *Delphinidæ* are still so imperfectly understood that I cannot say much about their geographical distribution. Most of the forms appear to be very widely distributed, but it may be said generally that Dolphins are most abundant in the inter-tropical seas, and less plentiful both to the north and south of them.

There are, however, two forms that are exclusively inhabitants of the North Atlantic. These are the very remarkable Narwhal, *Monodon*, in which the male is furnished with a single enormous horn-like tusk, and the Beluga or White Whale, *Delphinapterus*, closely allied to the Narwhal in many points of its general structure. These may be looked upon as quite isolated forms characteristic of the Arctic portion of the Atlantic, but not known in the Pacific.

V. *Division of the Marine Area of the Globe into Sea-regions.*

From what has been already said, it will be evident that, although many of the marine mammals have a wide distribution, others are very definitely localized; and a study of the latter will, I think, enable us to divide the oceanic portion of the globe into six sea-regions, corresponding to a certain extent with the six land-regions into which I proposed to separate the terrestrial portion of the globe in 1874, and which were subsequently adopted by Mr. Wallace in his standard work on the Geographical Distribution of Animals. I propose to call these sea-regions:—

(1) The NORTH ATLANTIC SEA-REGION OR ARCTATLANTIS (ἄρκτος and ἀτλαντίς = the daughter of Atlas), consisting of the northern portion of the Atlantic down to about 40° N. lat.

(2) The MID-ATLANTIC SEA-REGION OR MESATLANTIS (μέσος and ἀτλαντίς), consisting of the middle portion of the Atlantic down to about the Tropic of Capricorn.

(3) The INDIAN SEA-REGION OR INDOPELAGIA (ἰνδὸς and πέλαγος), containing the Indian Ocean down to about the same degree of S. lat., and extending from the coast of Africa on the west to Australia and the great Oriental islands on the east.

(4) The NORTH PACIFIC SEA-REGION OR ARCTIRENIA (ἄρκτος

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* See "A Review of the Family *Delphinidæ*," by Frederick W. True: Bull. U.S. Nat. Mus. No. 36, Washington, U.S. 1889.

and εἰρήνη = *pax*), containing the northern portion of the Pacific Ocean down to about the Tropic of Cancer.

(5) The Mid-Pacific Sea-region or Mesirenia (μέσος and εἰρήνη), containing the inter-tropical portion of the Pacific Ocean; and finally

(6) The Southern Sea-region or Notopelagia (νότος and πέλαγος), containing the whole of the South Polar Ocean all round the globe south of the above-mentioned limits.

We will now proceed to consider shortly the characteristic mammals of these six sea-regions.

VI. *The North Atlantic Sea-region, or Arctatlantis.*

Amongst the Pinnipeds two well-marked generic forms, the Grey Seal, *Halichœrus*, and the Bladder Seal, *Cystophora*, are exclusively confined to Arctatlantis. The True Seals, *Phoca*, and the Walrus, *Trichechus*, are found in this region and in Arctirenia; and of the former genus three species—*P. vitulina*, *P. grœnlandica*, and *P. barbata*—are actually common to both these sea-regions, while the Walruses—*Trichechus rosmarus* and *T. obesus*—of the two sea-regions are perhaps somewhat doubtfully distinguishable. It may be easily understood how this has come to pass, because the Seals and Walrus may in the course of time, during unusually mild summers, have extended themselves along the north coast of the American continent into the Northern Pacific. But Arctirenia, as we shall presently show, is markedly distinguishable from Arctatlantis by the presence of Eared Seals, *Otaria*, which are utterly unknown in the whole of the Atlantic area. *Otaria* is, in fact, as regards Arctatlantis, what I have called on previous occasions (see P. Z. S. 1882, p. 311) a "lipotype" of Arctatlantis, but what I now propose to designate a "lipomorph."*

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* On former occasions I have used the term "lipotype" for a natural group which characterises a particular locality by its *absence*. It would, however, perhaps be better to change the term to "lipomorph," because the type and its compounds have been generally employed in reference to the particular specimens of a species upon which original descriptions are based (*cf.* Thomas, P. Z. S. 1893, p. 241). In the same way a natural group which characterises a particular country may be called a "topomorph" (τόπος, *locus*, and μορφή, *forma*). Thus, in Africa *Giraffa* and *Phacochœrus* would be "topomorphs," and *Cervus* and *Ursus* would be "lipomorphs."

The Sirenians are entirely absent from the North Atlantic, and constitute another lipomorph of that area.

Coming to the Whales, we find the Mystacoceti well represented in the North Atlantic by *Balæna*, *Megaptera*, and *Balænoptera*, but of these the two latter are almost universally distributed over the ocean, and *Balæna* recurs again in the North Pacific, as well as in more southern latitudes; so that there is no genus of Whalebone Whales peculiar to Arctatlantis, although the great *Balæna mysticetus* has never been found elsewhere.

Proceeding to the Odontoceti, the case is different. Amongst the *Physeteridæ*, *Hyperoodon* is confined to Arctatlantis, and, as already explained, two very well-marked types of the *Delphinidæ*, *Delphinapterus* and *Monodon*, are likewise exclusively denizens of the North Atlantic Ocean. Arctatlantis therefore may be said to be well characterized by the possession of at least five genera of marine mammals not found elsewhere, viz. *Halichœrus*, *Cystophora*, *Hyperoodon*, *Delphinapterus*, and *Monodon*.

VII. *The Middle Atlantic Sea-region, or Mesatlantis.*

Mesatlantis has certainly not so many forms of marine mammals confined to its area as Arctatlantis, but there seem to be good grounds for its separation. As we descend towards the tropics the True Seals, *Phocinæ*, which are constituted to live in colder water, gradually fall off in number, and in Mesatlantis are no longer met with. But in their place we find the genus *Monachus*, or Monk Seal, restricted to Mesatlantis; one species, *M. albiventer*, occurring in the Mediterranean and on the North African coast; and a second, *M. tropicalis*, being found in the West Indies. Mesatlantis is likewise the true home of the well-marked Sirenian genus *Manatus*, one species of which, *M. americanus*, frequents the coast of America, and another, *M. senegalensis*, that of Africa.

As regards the Cetaceans, we are not able to say that Mesatlantis, although well furnished with many generic types of this order, has any one peculiar to it. We must therefore rest content with assigning two genera of marine mammals, *Monachus* and *Manatus*, as characteristic forms or topomorphs of the sea-mammal-life of Mesatlantis.

VIII. *The Indian Sea-region, or Indopelagia.*

The Marine Carnivora, so far as we know, are entirely foreign to Indopelagia, but the Sirenians are well represented by the Dugong, *Halicore*, which pervades all its northern coasts from North Australia to India and the Red Sea, and down the African coast to Lamu.* Whether the species of *Halicore* found at different points within this area are the same or different is still a matter of discussion, but there can be no doubt that *Halicore* is an exclusive inhabitant of Indopelagia. As regards the Whales of Indopelagia, we know that *Physeter*, *Cogia*, and *Ziphius*, and numerous forms of *Delphinidæ*, occur there; but I am not aware of any cetacean that is entirely restricted to this sea-region.

IX. *The North Pacific Sea-region, or Arctirenia.*

As was pointed out when speaking of Arctatlantis, Arctirenia has one genus of *Phocidæ* (*Phoca*) in common with the North Atlantic, and three of the species of this genus appear to be actually identical in these two sea-regions, whilst a fourth *Phoca*, *P. fasciata*, is only found in the North Pacific. The Walrus, *Trichechus*, is again a form of marine mammals common to both the great northern sea-regions. But the feature of Pinnipedian life that absolutely distinguishes Arctirenia from Arctatlantis is the presence in the former of three (if not four) well-marked species of the Eared Seals, *Otariidæ*, which are absolutely unknown in the vast extent of the Atlantic down at least to 30° S. lat.

Arctirenia has unfortunately lost its Sirenian, Steller's Seacow, *Rhytina stelleri*, the largest and finest modern representative of this formerly prevalent group, which since the days of the Pleistocene has greatly diminished in numbers; but I think we may still treat *Rhytina* as one of the characteristic forms of the Arctirenian sea-region. The North Pacific is also even at the present day the sole possessor of a remarkable genus of Whalebone Whales which combines the long head and elongate form of *Balænoptera* with the smooth skin of the throat and absence of the dorsal fin of *Balæna*.† This is the Grey Whale, *Rhachia-*

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* A fine specimen of the Dugong from Lamu (on the east coast of Africa, lat. 2° 50′ S.), obtained by Mr. J. C. Haggard in 1885, is in the British Museum.

† Flower and Lydekker, 'Mammals,' p. 241.

nectes glaucus, of Cope, which in these days is confined to the North Pacific, and does not range farther south than the 20th parallel in that ocean. At the same time it should be stated that indications have been discovered that a nearly allied form existed in the Atlantic in previous geological ages, though this is by no means certain. Besides *Rhachianectes*, *Balæna*, *Megaptera*, and *Balænoptera* are all represented in the North Pacific, and also many species of *Delphinidæ* of which little is at present known. But *Rhytina* and *Rhachianectes* are the only genera of marine mammals absolutely confined to Arctirenia.

X. *The Middle Pacific Sea-region, or Mesirenia.*

The Eared Seals, *Otaria*, must have necessarily passed through Mesirenia in their passage from south to north, though the only record of their recent presence in the central part of the Pacific is, so far as I know, the report that they were formerly found in the Galapagos. It should be stated, however, that Tschudi records the occurrence of two species of *Otaria* on the islands of the coast of Peru, and that in 1802 Humboldt met with an Eared Seal on the island of San Lorenzo, in the bay of Callao, which is only some 12° south of the equator.

Like *Otaria*, the Sea-elephant, *Macrorhinus*, has apparently in former ages travelled up the South American shores and established itself as far north on the coast of California as about 34° N. lat. The California Sea-elephant has been discriminated by Gill as a distinct species, *Macrorhinus angustirostris*, but its differences from the southern form, *M. leoninus*, seem to be but trifling.

As regards the Cetaceans of Mesirenia, our information is at present very imperfect, and I have little to say except that species of *Megaptera*, *Balænoptera*, *Physeter*, *Cogia*, and *Ziphius* certainly occur there, besides many representatives of the widely spread *Delphinidæ*.

XI. *The Southern Polar Sea-region, or Notopelagia.*

The wide ocean which surrounds the Southern Pole on every side, and extends up to 40° S. lat., seems to present, as regards its marine mammals, a nearly homogeneous fauna, which we will now briefly consider. In the first place it contains representatives of four genera of true *Phocidæ*: *Ogmorhinus*, *Lobodon*, *Leptonychotes*,* and *Ommatophoca*, which are peculiar to the southern seas, and are quite distinct from all their northern representatives in the Arctic Ocean. The Sea-elephant, *Macrorhinus*, is also a denizen of Notopelagia, though, as we have already seen, it has wandered north along the South American coast far into Mesirenia.

Like *Macrorhinus*, *Otaria* also, containing the group of Eared Seals, appears to have been originally an Antarctic group, and the greater number of its species, although nowadays very much reduced in numbers, are still found in the Southern Ocean. But the *Otariæ* have travelled still further north than *Macrorhinus*, and three, if not four, species, as already stated, are in these days well established inhabitants of Arctirenia.

The Sirenians are absent from Notopelagia, but Cetaceans of every kind are abundant. Besides one or more representatives of the true Whalebone Whale, *Balæna*, Notopelagia has a smaller representative of the group, *Neobalæna*, entirely restricted to its area. It has also representatives of *Megaptera* and *Balænoptera*, though it is doubtful how far they are even specifically distinct from some of their northern representatives.

Among the Toothed Whales, *Odontoceti*, we find a large Ziphioid form, *Berardius*, restricted to the Notopelagian area, while *Ziphius* and *Mesoplodon* also occur there. The Dolphins, *Delphinidæ*, are likewise numerous, and present some distinct species, but not, so far as our present knowledge extends, any generic forms that do not occur elsewhere.

But Notopelagia is sufficiently distinguished from all the five more northern sea-regions by possessing four genera of Seals and two of Cetaceans entirely restricted to its area.

XII. *Conclusions.*

It has therefore, I think, been shown that for the geography of marine mammals, the ocean may be most conveniently divided into six Sea-regions, which are as follows:—

I. Regio Arctatlantica, characterized by its Seals, *Phocinæ*, of which two genera, *Halichœrus* and *Cystophora*, are peculiar, whilst *Phoca* is common to it and Arctirenia; by the absence of Sirenians; and by the possession of three peculiar genera of Cetaceans, *Hyperoodon, Delphinapterus*, and *Monodon*.

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* This generic term, established by Gill in 1872, seems to take precedence of *Pœcilophoca*, proposed by Flower and Lydekker for the same type, *L. weddelli*, in 1891. *Cf.* Allen, 'North American Pinnipeds,' p. 418.

II. Regio Mesatlantica, sole possessor of the Monk Seal, *Monachus*, amongst the Pinnipeds, and of the Sirenian genus, *Manatus*.

III. Regio Indopelagica, characterized by the presence of the Sirenian *Halicore* and by the absence of Pinnipeds.

IV. Regio Arctirenica, with *Phoca* like the Regio Arctatlantica, but having *Otaria* also; the home of the (now extinct) Sirenian *Rhytina* and of the endemic Cetacean *Rhachianectes*.

V. Regio Mesirenica, without true Seals, *Phocinæ*, but having *Otaria* and *Macrorhinus* from the south; no Sirenian known.

VI. Regio Notopelagica, characterized by four endemic genera of *Phocidæ*, and by the presence of many *Otariæ*; without Sirenians, but with two endemic forms of Cetaceans, *Neobalæna*, and *Berardius*.

In conclusion I will call attention to some of the more remarkable points in the general distribution of the marine mammals, and to their apparent significance.

In the first place, it is evident that the Pacific has much more in common with the Notopelagian region than the Atlantic. *Otaria* and *Macrorhinus*, quite unknown in the Atlantic, extend themselves to the northern extremity of the Pacific, the former pervading that ocean up to Behring's Straits, and the latter reaching to the Californian coast. It follows that in former ages there must have been some barrier in the Atlantic which did not exist in the Pacific to stop their progress northwards. The only barrier I can imagine that would have effected this must have been a land uniting South America and Africa, across which they could not travel. Adopting this hypothesis, we have at the same time an explanation of the presence of the Manatee on both the American and African coasts. The Manatee could hardly live to cross the Atlantic. It is only found close to the coast, where it browses on sea-weeds and other vegetable food in shallow water. How did it travel from America to Africa (or *vice versa*), unless there were a continuous shore-line between them? The same may be said of the Monk Seal, *Monachus*, of which one species lives in the Mediterranean and on the African coast and islands and another in the West Indies. We can hardly believe that these creatures could easily traverse the whole Atlantic. The hypothesis of a former barrier of land between Africa and America, which we know is supported by other facts of distribution,* would alone explain the difficulty.

On the other hand, in the Pacific we find no such break between the north and south. The aquatic mammals of Notopelagia have evidently had free access to the whole Pacific for a long period and have well availed themselves of this facility.

Again, while the great Southern Ocean exhibits a considerable uniformity of marine mammalian life, we see the Northern waters divided into two distinctly recognizable regions by the interposed masses of land. All these facts, with the one exception of the supposed Atlantic Barrier, would tend in favour of the now generally accepted doctrine that the principal masses of land and water are not of modern origin, but have existed mainly in their present shapes throughout all ages.

Topomorphs of the Six Sea-Regions.

(1) Arctatlantis.—*Halichœrus. Cystophora.*—*Hyperoodon. Delphinapterus. Monodon.*
(2) Mesatlantis.—*Monachus.*—*Manatus.*—*Inia. Pontoporia.*
(3) Indopelagia.—*Halicore.*—*Platanista.*
(4) Arctirenia.—*Otaria.*—*Rhytina. Rhachianectes.*
(5) Mesirenia.—*Otaria. Macrorhinus.*
(6) Notopelagia.—*Ogmorhinus. Lobodon. Leptonychotes. Ommatophoca. Otaria.*—*Neobalæna. Berardius.*

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* *Cf.* Wallace, Geogr. Distrib. i. 156.

OBITUARY.

Edward Drinker Cope.

By the death of Prof. Cope, of Philadelphia, which took place on April 12th, Biology in America has sustained its greatest loss since the decease of Agassiz, and as zoologist, as well as both geologist and palæontologist, his life work demands recognition wherever zoology is a cultivated science and pursuit.

Prof. Cope was born in Philadelphia on July 28th, 1840, took his degree of Ph.D. at Heidelberg in 1864, and during the remainder of a busy life effected much for the ever-growing knowledge of both living and extinct animal life in his own land. He became successively Professor of Natural Science in Haverford College, a member of many of the well-known United States Geological Expeditions, Vertebrate Palæontologist to the Hayden Survey, Professor of Geology and Mineralogy at Pennsylvania University, and subsequently Professor of Zoology and Comparative Anatomy. He was also a chief editor of our esteemed contemporary the 'American Naturalist,' and in 1895 President of the American Association for the Advancement of Science.

It is impossible here to fully refer to his zoological work, which lay among the vertebrata, and which has formed the subject of very many papers, and also the contents of several handsome volumes. These are sometimes somewhat overlooked by referring only to his philosophical opinions. It is not infrequent to see a popular zoological generaliser considered as possessing the technical knowledge of a zoologist, while as often a specialist who indulges in the philosophical discussion of his subject is looked upon chiefly as a man of views and theories. Prof. Cope combined both qualities. To a most exhaustive and accurate knowledge of his subject, both living and fossil, was added a power of drawing conclusions and advancing opinions which, while always displaying a great intellect, were frequently considered heretical by the holders and promulgators of different views and other theories on organic evolution. His recent work on 'The Primary Factors of Organic Evolution' is a case in point, and it is well to remember that to really keep abreast of the current biological thought of the day it is necessary to read and study Cope and Eimer as well as Wallace and Weismann.

We have also to record the deaths of the following zoologists:—

Major Charles E. Bendire, who died at Jacksonville, Florida, U.S.A., on February 4th, was born in Hesse Darmstadt, on April 27th, 1836, and went to America in 1852, where he undertook considerable military service. As an ornithologist he will be perhaps best remembered by his well-known 'Life Histories of North American Birds,' of which the second volume recently appeared, leaving the whole work, however, less than half completed. We learn from 'The Auk' that his immense collection of birds' eggs, gathered during his military wanderings, long since became the property of the United States National Museum, where their donor had held for some years the position of Honorary Curator of the Department of Oology.

Sir Edward Newton, K.C.M.G., died at Lowestoft on April 25th, in the sixty-fifth year of his age. He held several important Colonial Government appointments, and he was fortunately a member of the mission sent by the government of Mauritius to congratulate the late King of Madagascar on his accession to the throne, when, according to 'Nature,' being an ardent ornithologist, he seized the opportunity (as he did during a subsequent visit made with that express purpose) to materially increase the knowledge of the very peculiar fauna of that country, which he was almost the first English naturalist to investigate on the spot. He also largely increased our knowledge of the zoology of the Mascarene Islands, and it was mainly due to his exertions that nearly complete skeletons of the "Solitaire" of Rodriguez were recovered from the caves of that island, as described in the 'Philosophical Transactions' of the Royal Society. Sir Edward was also one of the founders of the British Ornithologists' Union.

Mr. Hugh Nevill, F.Z.S., of the Ceylon Civil Service, died at Hyères on April 10th. Mr. Nevill had been an indefatigable collector during twenty-seven years' service, had discovered and described many new species in zoology, and had contributed many specimens to our museums. Quoting from the 'Athenæum,' "his collection of birds passed to the late Marquis of Tweeddale; but a large and very complete collection of certain genera of shells remains."

NOTES AND QUERIES.

MAMMALIA.

CHIROPTERA.

Long-eared Bats and their Food.—Along the valley of the Dowles Brook, in the Wyre Forest, this little Bat is numerous. Whilst watching their movements I found they were working the sallow-trees along the stream-sides, feeding upon the dissipated little *Noctuæ* that can always be found intoxicating themselves upon the bloom in the early spring. One or more Long-eared Bats could frequently be seen circling around the tops of the bushes; and when a moth attracted their attention they would steady themselves in their flight, and with quivering wings (which sometimes gave one an impression of their perching), seize their prey, frequently from off the bloom itself. After thoroughly working one bush they made off to another for the same purpose, when doubtless within a short space of time sufficient food for that night would readily be taken. Whilst watching these little creatures I was surprised at their inquisitiveness and utter fearlessness in my presence; occasionally one would leave the bush and circle around within a few inches of my face and body, its presence often only being recognized by the vibration of the air, which gave one a very uncanny feeling.—J. Steele Elliott (Dixon's Green, Dudley).

INSECTIVORA.

Lesser Shrew in Cheshire.—On March 27th I was pleased to find the skull of a Lesser Shrew, *Sorex minutus*, in an owl-pellet obtained in Dunham Park. This is the second example recorded from Dunham Park, and the fourth from the county. Fifty-four pellets, taken from the foot of two trees, showed the following result on analysis:—Eight Sparrows, one Blue Tit, one Rat, fourteen House-mice, twenty-six Long-tailed Field Mice, one Water Vole, sixty Field Voles, three Bank Voles, forty-nine Common Shrews, three Water Shrews, and one Lesser Shrew. Although the Bank Vole is common in Cheshire, it is very much rarer than the Field Vole on the park-land.—T. A. Coward (Bowdon, Cheshire).

AVES.

Honey Buzzard in Staffordshire.—I have been fortunate enough to save from oblivion a beautiful specimen of *Pernis apivorus*. Acting on information received, I visited the cottage of a keeper, and induced him to sell me the bird for my collection. It was shot by this keeper at Little Aston, Staffordshire (within a few yards of the adjoining county of Warwickshire), on June 16th, 1894. It had been set up and made into one of those idiotic distortions which are so dear to the hearts of the old type of bird-stuffer; but, thanks to the unrivalled taxidermic skill of Mr. F. Coburn, it has now been made into a specimen of rare grace and beauty. Judging by its large size, the specimen was evidently a female, and as there was a large patch on the abdomen denuded of feathers, it was probably breeding. The man said that the bird was on the topmost branch of a tall tree when he shot it, and there were several large nests about, but they might have been Rooks' nests for all he knew. The bird is of the dark form, the whole of the upper and under parts being of a rich dark brown. I can only find one previous record for this bird in Staffordshire, and none for Warwickshire. Garner, in his 'Natural History of the County of Stafford,' page 271, says, "Shot this summer at Trentham," but gives no date; however, as the book was published in 1844, it may have been in 1843 or 1844. E. Baylis (Stafford Street, Birmingham).

Long-eared Owl breeding in Essex.—While walking through Pheasant-house Wood, Little Baddow, with my boys, on April 15th, I noticed an Owl flit noiselessly out of a large Scotch fir; seeing a squirrel's drey or old crow's nest, one of my sons made an inspection, and soon disturbed the other Owl. The nest contained two eggs. We again saw the Owls in the same tree on April 23rd, so trust they may be successful in bringing off their brood. In Miller Christy's 'Birds of Essex' (p. 155) we read, "I never actually heard of its breeding in the county, except at Harwich, though it has probably done so elsewhere."—Edward A. Fitch (Maldon, Essex).

Food of the Knot.—In the early autumn the great stretches of sand which extend along the north Norfolk shore from Hunstanton to Blakeney are the resort of innumerable waders. Knots and Dunlins are perhaps the most abundant of these migratory hosts. The chief food of these two species is a little gasteropod, *Paludestrina ulvæ* (Pennant), which occurs in countless numbers on these sand-flats. I examined the contents of the stomachs of a large number of these birds last September, and in every instance the small mollusc above mentioned composed the principal food of the Knot. In order to render the identification complete of the Mollusca found in the Knots, I submitted the contents of the stomachs of five individuals killed in September to Mr. Edgar A. Smith, F.Z.S., of the British

Museum (Natural History). With his usual kindness he sent me the following reply:—"The shells contained in the five bottles are *Paludestrina ulvæ* (Pennant), commonly called *Hydrobia ulvæ* in books. As *Hydrobius*, which is practically the same as *Hydrobia*, was preused in insects, I think it advisable to employ D'Orbigny's name *Paludestrina*. It is a common species in most estuaries. Bottle six (contents of stomach of Golden Plover) contains three species, *viz.* the same *Paludestrina*, several specimens of *Littorina rudis*, Maton., and a single example of *Alexia myosotis* (Draparnaud). The *Alexia* is also estuarine, and the *Littorina* may be found both on the coast and in the mouths of rivers."— H. W. Feilden (Wells, Norfolk).

White Wagtail nesting in Suffolk.—On April 26th I took a nest with five eggs of the White Wagtail, clearly identifying the hen bird on the nest, and also when she settled on the ground a few yards off. The nest was built in the side of a cattle-shed, and the farm-lad who showed it to me had watched it for some time, and assured me that both birds were alike. We have had more than one instance of the Pied and White Wagtails interbreeding in the Eastern Counties. I refrain from recording the precise locality of this nest, as I do not wish the parent birds to be killed; but it is in West Suffolk, and within an easy walk of this house.—Julian G. Tuck (Tostock Rectory, Bury St. Edmunds).

Red-legged Partridge Migrating.—Supplementary to Mr. Clarke's note (*ante*, p. 166), it may be worth while stating that on the 16th March last one of Mr. Edwin Baylis's boatmen found a Red-legged Partridge dead on the beach at Bournemouth, and forwarded it to him here. The bird had been washed in by the tide, and was so exceptionally clear and brilliant in its colours that it has been mounted for Mr. Baylis's collection. This seems to point to the fact that a considerable migration of these birds may have taken place between March 16th and 22nd. I thought the fact that these birds did occasionally migrate was now fairly well established.—F. Coburn (7, Holloway Head, Birmingham).

REPTILIA.

The Australian "Rock-Lizard."—This species, *Amphibolurus muricatus*, White, is one of the commonest of Australian Lizards, and abounds principally in rocky situations. Its habits are sharp and active. When watching an object it raises its (comparatively) large head high above the ground and, twisting it on one side, blinks in a comical manner. In shape the head is not unlike that of the Frilled Agama, *Chlamydosaurus kingi*. I have been much struck with the habit this Lizard has (in common with many other animals) of feigning death when caught or wounded.

I once gave one a pretty severe knock with a stick, and, supposing it to be dead, put it in my pocket, from which it escaped half an hour after as I walked along. Once more I struck it, and thought there could be no doubt of its death; but, happening to look about ten minutes after, I noticed it cautiously opening its eyes. On another occasion I experimented with one which had been in my possession for some time. I took it up by the middle, when it directly let its head and tail droop and closed its eyes, simulating death. I then laid it on its back (which was a very uncomfortable posture, considering that its back was bent into a bow-shape), and it remained in that position with its head and long tail quite stiff and not touching the ground. After about fifteen minutes had elapsed it cautiously opened one eye, but otherwise did not move until half an hour had elapsed, when it slowly turned its head round, suddenly jumped up, and ran away. When chasing its prey, or when being pursued, this species darts along with great rapidity, but often takes no notice of an intruder, relying on its colour, which assimilates so readily with the surrounding rock that it is sometimes very difficult (even when quite close) to distinguish it. It is oviparous. The tongue, which is full and rounded at the extremity, is covered with a viscous fluid, by help of which it secures its prey, which consists of spiders, insects, &c. The ordinary length of a full-grown specimen is about fifteen inches, two-thirds of which are taken up by the tail.

I have never met with a more variable species. Specimens taken from each end of the scale of variation would undoubtedly be regarded as distinct species were it not for the connecting links. Some have the dorsal ridge distinctly serrated, while in others it is quite smooth. Again, as regards coloration, many of them have a row of oblong-ovate spots of a light French-grey colour (quite distinct from one another) on each side of the dorsal ridge, while in others these spots are so connected as to form one straight wide band. Another noticeable character is change of colour by heat. The largest specimen I procured, and which was found under a stone on a cold day, was, when caught, a dull slaty colour, almost black; but, on looking at it after a few days, I was surprised to find it changed to a mottled grey colour, with light spots along each side of the median ridge. I have observed since that on cold mornings before the sun shines it is the dark colour, but as the warmth increases it gradually becomes lighter in hue, until it assumes the pale colour before mentioned. This Lizard is sometimes externally infested with a species of tick, and internally with two or more species? (or varieties) of Entozoa.—David G. Stead (Sydney, N. S. W.).

PISCES.

Large Holibut at Isle of Man.—A fine Holibut, *Hippoglossus vulgaris*, was brought into Ramsey Market on April 8th, having been taken by the trawl-boat 'Swift' off Bahama Bank. I saw it at the fish-dealer's (Aldritt's), and found it measured 6 ft. 6 in. by 2 ft. 6 in., and 8 in. thick. I asked that it might be weighed, but on my return found that it had been cleaned and packed to be sent across the water. I now hear that it was then weighed at 200 lbs. About 14 lbs. had been removed in the cleaning of it. In its stomach was a whole cod and many fish-bones. I have a note of one taken at the same place in November, 1891 (140 lbs.), in which was a recently swallowed cod. Day, in his 'British Fishes,' quotes Lacépède to the effect that in Greenland these fish "appeared to prefer localities also frequented by the cod, as they probably seek the same food." Evidently it simplifies matters to make one mouthful of the cod and his food together. It appears that in April, 1829, an example, 7½ ft. long and 320 lbs. weight, was taken off the Isle of Man, one of the largest recorded in the British Islands.—P. M. C. Kermode (Ramsey, Isle of Man).

Occurrence of the Cuckoo Ray at Great Yarmouth.—Couch, in describing this Ray, remarks that "this well-marked species has been overlooked or mistaken by many naturalists." Such appears to have been locally the case, for, until Feb. 4th, it remained unidentified in this neighbourhood, when a message from a fish merchant reached me to the effect that "a queer Skate had turned up." The gentleman referred to (amongst others) keeps an eye open for "strangers." Hence the opportunity afforded of examining what turned out to be a very interesting take. This fish was caught on the hooks of a steam long-liner sailing out of this port, and fishing along the coast as far as Grimsby, returning every two or three days with her catches. The Ray was yet "stiff" and ungutted. It was a 26-inch female, and contained eggs running from the size of snipe-shot to chestnuts. Couch hints that its spawning-time may be December, but leaves a wide margin when remarking he had seen eggs just ready to be shed in July. The fish much resembles a "Honer," *Raia maculata*, in shape and build. Colour yellowish drab, verging on to red at the fin-borders. The surface of the disc (back) is adorned with short spines, a half-circular row of which defend the back of each eye; a triangular group decorate the "shoulders," whilst the tail, which is stout at the origin, tapers off posteriorly, and has two fins near the end. It has a gutter-like depression running its whole length, protected on either side by five rows of spines. The pair of marbled circular blotches, of black and white, each the size of a half-crown, are very distinct. The specimen has been preserved for Yarmouth Museum.

A somewhat smaller male came to hand on Feb. 16th, whilst a third

I secured on April 16th was forwarded to Norwich Museum. Two, which I did not see, were brought in contemporaneously with the last, and were cut up for sale. Thus in a few weeks, and of a species not before locally identified, five specimens have occurred off the coast, and it may undoubtedly lay claim to insertion in the county list.—Arthur Patterson (Yarmouth, Norfolk).

INSECTA.

Birds feeding on the Larvæ of the Magpie-moth.—I was interested in reading the note in connection with this species, *Abraxas grossulariata* (*ante*, p. 169), I see that Mr. Butler, in the work on British Birds and Eggs, with illustrations by Mr. Frohawk, now in course of publication, states "that no bird will touch the larvæ of the Gooseberry Moth," by which, I take it, he means *Abraxas grossulariata*. I can assure him that the Cuckoo will do so readily. Some years ago, in a large orchard of ours, the gooseberry and currant trees were infested with this pest, and at the same time numbers of Cuckoos appeared. We did not connect the two at first, but my father shot one bird, and its stomach was found to be crammed with these obnoxious larvæ.—Oxley Grabham (Heathwold, Goathland).

MOLLUSCA.

Early Snails.—On Christmas Day, 1896, at about 10 a.m., I saw a Snail, *Helix nemoralis*, adult, extended at full length, and crawling along the road. A good deal of rain had fallen during the previous night. On March 2nd of the present year I again met with this species abroad. This also was a full-grown specimen, and was found crawling on a wet piece of wood at the edge of a ditch. *Limnæa peregra* is often to be seen here crawling about in numbers as early as February. — G. T. Rope (Blaxhall, Suffolk).

NOTICES OF NEW BOOKS.

Man and Woman: a Study of Human Secondary Sexual Characters. By Havelock Ellis. Walter Scott Limtd. 1896.

This publication forms a recent addition to the "Contemporary Science Series," of which the first volume, which appeared in 1889, was written by Geddes and Thomson, and devoted to the question of the "Evolution of Sex"—a biological problem of no mean importance, and one which few zoologists have not in some form, or at some time or other, been forced to consider. There is therefore a somewhat natural sequence in Mr. Ellis's more special contribution to a knowledge of the real differences which divide the human sexes—a study of the deepest importance to the anthropologist and of no little interest to the zoologist. Perhaps no fact in nature has been more universally observed, and as well by the ignorant peasant as by men of the highest culture, that in thought and sentiment men and women are diverse. But, as our author observes, though perhaps with some asperity:—"For the most part questions of sexual difference have been left of recent years to magazine essayists—whose lucubrations are generally too slight and too purely literary to deserve mention—and to philosophers; of the latter, Lotze, Schopenhauer, and Herbert Spencer have perhaps touched the matter with most acuteness, though perhaps in an incomplete and one-sided manner." This, however, can scarcely be said of Darwin's masterly exposition of "Sexual Selection in relation to Man," with which the question in recent years was really focussed.

One of the main contentions of Mr. Ellis is that woman is not "undeveloped man," but rather that "women remain somewhat nearer to children than do men." To understand the gist and real tendency of this argument it is necessary to remember that in animal life there is much deterioration, or departure from the evolutionary ideal in the adult stage. "The infant ape is very much nearer to man than the adult ape." "The ape starts in life with a considerable human endowment, but in the course of life falls far away from it; man starts in life with a still greater portion of human or ultra-human endowment, and to a less extent falls from it in adult life, approaching more and more to the ape." Woman is therefore on these lines not degraded by the comparison of an infantile diathesis.

Whether, however, the reader who peruses the wonderful array of facts marshalled in this book—and there is not a dull page—will come to the same conclusion as the author is a very open question, but assent or dissent on this point is unnecessary to the real value of the volume, which may be called a monograph of human sexual variation. In conclusion, we heartily concur with Mr. Ellis in the view that "To arrive at any reliable knowledge of mental sexual differences it is no longer enough to formulate suggestive impressions or brilliant theories. These have a certain interest and value, it is true, but they have no part in any knowledge that can be called science. It is along the lines of precise experiments that we may reasonably hope to obtain a more definite and objective knowledge of mental differences."

Society for the Protection of Birds. — "Educational Series." Edited by H. E. Dresser, F.L.S., F.Z.S. Part I., containing Nos. 1 to 11 inclusive. 'Knowledge' Office. 1897.

There sometimes seems an impression abroad that ornithologists are a body of enthusiasts who seek to destroy birds in order that they may study them afterwards; and it is not long since that the present Editor was told that 'The Zoologist' was a magazine devoted to chronicling the details of bird slaughter. At all events the "Society for the Protection of Birds" receives the support of some of the ornithologists well known to our readers, for these "Educational Series" are not only edited by Mr. H. E. Dresser, but include among the contributors the names of Thomas Southwell, O. V. Aplin, and J. A. Harvie-Brown.

It is to be hoped that this little publication may be circulated broadcast over the country; in fact, we should be glad to see it made the occupation for a few ornithological colporteurs. We are not among the fanatics who decry the necessary process of addition to the ornithological cabinets, which has afforded us delight and instruction in the past, and is still anticipated as a cherished hope of the future, but there are birds in this country—to go no further afield—to which only organised protection can prevent ultimate extermination, for ignorance of their habits is a principal cause of their destruction. In this first instalment of the series, the birds described are Owls, Woodpeckers, Starlings, Swallows, Kingfisher, Osprey, Dippers, Nightjar, Titmice, Kestrel, and Plovers, and a woodcut is given of each, so that he who reads can clearly understand. Not only are their food and habits enumerated, but the penalties for their destruction are clearly detailed, a perusal of which will certainly surprise many a bird-nesting boy and amateur bird-catcher.

A Hand-Book to the Order Lepidoptera. Vol. IV. Moths, Part II. By W. F. Kirby, F.L.S., F.E.S., &c. W. H. Allen & Co., Limtd. 1897.

This is another volume of "Allen's Naturalists' Library," and forms part of the section devoted to Entomology, a subject entrusted to Mr. W. F. Kirby. The present volume refers to thirteen families of moths, of which the Sphingidæ, Bombycidæ, Saturniidæ, and Lasiocampidæ are perhaps the most generally known to most readers. Many of the more important genera and species are described from all parts of the world—a special and fuller treatment being accorded to our British species—and the coloured plates, of which there are no fewer than thirty-one, contain representations of some species not before figured, and others of great rarity. But useful and interesting as these features are, this book will be more often consulted for an excellent essay "On the Systems of Classification of Moths," and a still more important "Sketch of the Literature of Lepidoptera." Mr. Kirby is well known as one of the best entomological bibliographers of the day, and therefore in these articles we find a most accurate condensation of literary information which an amateur will find instructive, and a specialist interesting reading.

The first essay, devoted to a retrospect of the principal systems proposed for the classification of moths, commences with that of Linnæus in 1758, and terminates with that of Dr. Packard in 1895. A survey, or rather a study, of these propositions, made in a fairly eclectic spirit, cannot fail to be advantageous to the method of a cabinet arrangement, even if leading to no higher biological conception.

In the sketch of the literature of Lepidoptera we are somewhat appalled by being reminded that "eighteen languages at least are employed in entomological works at the present day." *Class A*, of which a knowledge is considered necessary, includes English, French, Latin, and German. *Class B*, important but less necessary, comprises Dutch, Swedish, and Russian. *Class C*, valuable, but still less necessary, contains Italian, Spanish, Portuguese, Danish, and its near ally Norwegian. *Class D*, sometimes wanted, as Polish, Czech, and Magyar. *Class E*, probably unimportant, in which is enumerated Croatian, modern Greek, and Japanese. We are consoled by the reflection that though we know many entomologists, we are unacquainted with any possessing such polyglot accomplishments.

The faunistic bibliography given by Mr. Kirby is an excellent compilation, containing all that must be consulted for a primary knowledge of the Lepidoptera of the various regions detailed. There is also to be found a good list of the principal "books on Lepidoptera in general."

EDITORIAL GLEANINGS.

A considerable amount of interest attached to the sale by auction, on April 13th, at Messrs. J. C. Stevens's Rooms, in King Street, Covent Garden, of a very fine and perfect specimen of an egg of the Great Auk. There was a large attendance, and after a spirited competition, the bidding starting at 100 guineas, quickly rose by five and ten-guinea bids until the sum of 280 guineas was reached, at which price it was knocked down to Mr. T. G. Middlebrook. During the last twenty years the pages of this Journal have recorded the sales of several of these high-priced eggs, in the same well-known sale-rooms:—

'Zoologist,'	vol. iv.	p. 365	July 2nd, 1880	2 eggs	£100 and £105 2s.
,,	,, xii.	p. 28	Dec. 13th, 1887	1 egg	£168.
,,	,, ,,	p. 143	Mar. 12th, 1888	1 ,,	£225.
,,	,, xviii.	p. 108	Feb. 22nd, 1894	1 ,,	£315.
,,	,, xix.	p. 193	April 23rd, 1895	1 ,,	£189.
,,	,, ,,	p. 269	June 25th, 1895	1 ,,	£173 5s.
,,	,, xx.	p. 192	April 20th, 1896	1 ,,	£168.

Mr. Thomas Thompson writes ('Newcastle Daily Journal,' April 28th), that "on the 20th March he noticed a Thrush's nest in a yew tree in his orchard at Winlaton, and on the 27th it contained Blackbird's eggs, the old female Blackbird flying off. He also saw the male Thrush at different dates sitting very close in the nest on the young birds, but on Friday, the 23rd inst., on examining the nest, he was grieved to see that it had been interfered with by some small animal, most likely a Mouse, as a hole had been made through the side. This work must have alarmed the parent birds. The nest contained one young bird only, and though warm it was dead. Mr. Duncan, of Newcastle, received it the same day for preservation. Mr. Thompson adds that in over fifty years' experience he never came across a like instance or yet ever heard of such."

In the 'Annals of Scottish Natural History' for April, Mr. William Eagle Clarke records the occurrence of the Frigate Petrel, *Pelagodroma marina*, on the west coast of Scotland. It was captured alive on the margin of a stream on the west side of the island of Colonsay, on Jan. 1st of the present year. The weather immediately preceding this bird's visit to the west coast of Scotland was characterized by severe gales from the south-west, and these may, perhaps, have been instrumental in driving it from its accustomed haunts, the nearest of which are in the vicinity of the Canary Islands; but it is a wide ranging species in the Southern Seas. The only other visit of this Petrel to Europe was also to the west coast of Britain, a specimen having been washed up dead on the sands of Walney Island, Morecambe Bay, in November, 1890, as recorded by the Rev. H. A. Macpherson.

We are indebted to Lt.-Gen. Pitt-Rivers for a copy of 'A Short Guide to the Larmer Grounds, Rushmore; King John's House, and the Museum at Farnham, Dorset.' The acclimatization of animals in the park and paddocks at Rushmore is a very pronounced feature. "The Fallow Deer has been crossed with the Mesopotamian Deer, the Japanese Deer with the Red Deer, and these again with the Formosan Deer. The Yak has been crossed with the Pembroke, the Highland cattle, the Kerry, and the Jersey. The Zebu (Indian humped cattle) with the Jersey, producing a very fine animal, and these again with the Jersey. The park and small menagerie contain Llamas, Emus, Rheas, and Kangaroos; also a small brown breed of Sheep from St. Kilda, which resembles the Roman Sheep found in the Romano-British villages here; a breed of black four-horned Sheep, piebald Assyrian Sheep, and Aden Sheep. The Prairie Dogs have bred, but are now dead. Australian Parrots stand the climate fairly well, whilst those from South America are difficult to rear. The White Peacocks do not breed true, but reproduce their like occasionally, The Impeyan Pheasant has been found difficult to rear. Piebald Peacocks and Javanese Peacocks have also been bred here. The Australian Bower-bird has built its bower in the bird-sheds, but it is now dead. The animals in the menagerie vary from time to time. Reindeer have been let loose in the park, but have succumbed to the heat of the summer months."

In the February number of 'Appleton's Popular Science Monthly,' published in New York, is an interesting article by W. S. Blatchley, the State Geologist of Indiana, on "How Plants and Animals spend the Winter." Amongst the many forms of animal life to which reference is made are Myriapoda. "Full forty kinds of myriapods occur in any area comprising 100 square miles in the eastern United States. . . . All those found in the Northern States are perfectly harmless, the true Centiped, whose bite is reputed much more venomous than it really is, only being found in the South. . . . In winter three or four species can usually be found within or beneath any decaying log or stump. One species, with very long legs, is often found in damp houses or in cellars. It is sometimes called the 'wall-sweeper,' on account of its rapid ungainly gait, and it is even reputed to prey upon Cockroaches and other household pests."

MR. A. W. ANTHONY, of San Diego, California, has recently examined a very large colony of Farallone Cormorants, nesting on San Martin Island, Lower California, to ascertain, if possible, at what age the nostril becomes closed. "This colony had been so often disturbed by the guano schooners, that even at this late date (July 16th) many nests contained fresh eggs; while young birds, ranging from those but just hatched to nearly full grown, were found by thousands." In the newly hatched young, which were blind, the nostril was a mere slit, scarcely noticeable, but those a few days old showed a well developed orifice, which exhibited no sign of closing in the largest young I could find, nearly as large as their parents, but not half fledged." ('The Auk,' April, 1897.)

WE are glad to see that our American contemporary, 'The Osprey,' has come to stay, and that the veteran ornithologist, Dr. Elliott Coues, has become associated with the magazine as a consulting editor. From its pages we extract the following report from a collector in Howkan, Jackson, Alaska, which makes that somewhat generally considered inhospitable region to appear as a naturalist's paradise:—

"Have been here now a month and am having a 'great time.' Am nicely located in a cabin on the beach, with a good canoe and enough to eat. Deer are plentiful, and I have four hanging in the shed. A fine Clam bed is in front of the house, a Salmon stream up the beach, a Holibut bank in the channel, and Ducks, Geese and waterfowl everywhere. Bald Eagles are numerous, and I have over a dozen nests located. . . . I have been so busy with various odd jobs and away on prospecting trips that I have not really settled down to collecting as yet, but I have taken some nice birds—Kowak, Chickadee, Aleutian Song Sparrow, Alaska Winter Wren, Alaska Three-toed Woodpecker, and others. A few Harlequin Ducks are about, but hard to shoot. Ptarmigan are plentiful, but I have not obtained any yet, and do not know of what species they are. Cormorants are abundant; they 'line up' on a rock just opposite the house, and one shot will generally kill as many specimens as can be put up in a day. They are mostly violet-green and white-crested, but there is another kind that I have not been able to capture as yet. Marbled and another species of Murrelet are very common on the open water, in company with the larger Guillemots"

WE learn from the last 'Report of the Albany Museum, Grahamstown, South Africa,' that "the alarming spread of insect pests in the Eastern

Province has occupied the attention of the committee for some time past, and it was thought that it is largely due to the wholesale destruction of insectivorous birds. As under the provisions of the game-laws of this country, divisional councils and municipalities have, subject to the approval of Government and his Excellency the Governor, the power of protecting any birds for a period of several years, a circular was addressed by the committee to the municipalities and divisional councils of the Eastern Province, recommending (1) that certain birds and their eggs should be protected; (2) that saloon rifles, air-guns and catapults be classed as weapons, and placed under the same restrictions as firearms." It is hoped that "by strictly enforcing these regulations we may see within a short time a considerable increase in the number of our feathered friends."

WE have received the fifth volume of the 'Journal of Malacology,' with its excellent bibliography of current literature on its special subject. A paper by Mr. G. W. Chaster, on "Some New Marine Mollusca from Tangier," is noteworthy, if only by the description of the material from which the specimens were obtained, *viz.* "heaps of anchor-mud and dredgings" obtained during a Mediterranean cruise. "The material from Tangier consisted of a bag of dredgings (weighing but a few pounds) from about seven fathoms, and a quantity of shore-sand brought on board for the purpose of deck-scrubbing." This produced five new species, and a new genus of Mollusca.

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